

9/21/16

"What you do today can improve all your tomorrows"-Ralph Marston

HW: "Fractional Exponents" back #38, 43, 48, 54, 59, 61, 64, 67, 71, 75, 78

Aim: What do Fractional Exponents tell us?

Warm Up:

Simplify:

$$\left(\frac{x^3}{y^2} \right)^{-1} = \frac{x^{-3}}{y^{-2}} = \frac{y^2}{x^3}$$

The diagram shows the simplification of $\left(\frac{x^3}{y^2} \right)^{-1}$. The first step shows the fraction with a negative exponent. The second step shows the fraction with the numerator and denominator swapped and the exponent made positive. The final result is $\frac{y^2}{x^3}$.

ALT:

$$\left(\frac{x^3}{y^2} \right)^{-1} = \left(\frac{y^2}{x^3} \right)^1$$

⊗ If a fraction is raised to a negative power, flip the fraction and make the power positive.

$$5^{-1} = \frac{1}{5}$$

If $x \geq 0$ and n is a positive integer then:

$$(1) \quad x^{\frac{1}{n}} = \sqrt[n]{x} \qquad \sqrt[2]{x} = \sqrt{x} = x^{\frac{1}{2}}$$

$$(2) \quad x^{\frac{m}{n}} = (\sqrt[n]{x})^m = \sqrt[n]{x^m}$$

★ Think: $\frac{\text{Power}}{\text{Root (index)}}$

$$(3) \quad x^{-\frac{m}{n}} = \frac{1}{(\sqrt[n]{x})^m} = \frac{1}{\sqrt[n]{x^m}}, x \neq 0$$

Examples:

$$1. 225^{\frac{1}{2}} = \sqrt{225} \\ = \sqrt{15^2} = \boxed{15}$$

$$2. 27^{\frac{1}{3}} = \sqrt[3]{27} = \boxed{3}$$

$$3. \left(\frac{64}{27}\right)^{\frac{1}{3}} = \sqrt[3]{\frac{64}{27}} = \frac{\sqrt[3]{64}}{\sqrt[3]{27}} = \frac{\boxed{4}}{\boxed{3}}$$

$$4. 27^{\frac{2}{3}} = \sqrt[3]{27^2} = \sqrt[3]{729} = 9$$

OR $(\sqrt[3]{27})^2 = 3^2 = 9$

$$5. 32^{-\frac{3}{5}} = \frac{1}{32^{\frac{3}{5}}} \\ = \frac{1}{(\sqrt[5]{32})^3} = \frac{1}{2^3} = \frac{1}{8}$$

$$6. 16^{\frac{3}{2}} = (\sqrt{16})^3 \\ = 4^3 = \boxed{64}$$

$$7. \frac{2^0}{9^{-\frac{3}{2}}} = \frac{1}{9^{-\frac{3}{2}}} = 9^{\frac{3}{2}} \\ = (\sqrt{9})^3 = 3^3 = \boxed{27}$$

$$8. (-25)^{\frac{1}{2}} \\ = \sqrt{-25}$$

* error: non real

$$9. -25^{\frac{1}{2}} \\ -1 \cdot 25^{\frac{1}{2}} \\ -1 \cdot \sqrt{25} \\ -1(5) \\ \boxed{-5}$$

$$10. \left(\frac{-8a^3}{b^{-6}}\right)^{\frac{2}{3}} \\ (-8a^3b^6)^{\frac{2}{3}} \\ (-8)^{\frac{2}{3}} a^{3 \cdot \frac{2}{3}} b^{6 \cdot \frac{2}{3}} \\ (\sqrt[3]{-8})^2 a^2 b^4 \\ (-2)^2 \downarrow \downarrow \\ \boxed{4 a^2 b^4}$$

Rewrite each of the following using Rational Exponents:

$$11. 5\sqrt{x} = \boxed{5x^{\frac{1}{2}}}$$

$$12. \sqrt[3]{5x^2} = \boxed{5^{\frac{1}{3}} \times x^{\frac{2}{3}}}$$

$$13. \sqrt[3]{(5x)^2} = (5x)^{\frac{2}{3}} = \boxed{5^{\frac{2}{3}} \times x^{\frac{2}{3}}}$$

$$14. \sqrt[5]{x^4 y^3} = \boxed{x^{\frac{4}{5}} y^{\frac{3}{5}}}$$